REMARKS

I. General

Claims 1-20 were pending in the present application, and all of such claims are rejected in the current Office Action (mailed March 22, 2004). The outstanding issues raised in the current Office Action are:

- Claims 1-11 and 13-20 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,163,319 issued to Peercy et al. (hereinafter "*Peercy*"); and
- Claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Peercy* in view of U.S. Patent No. 5,710,876 also issued to Peercy et al. (hereinafter "*Peercy '876*").

In response, Applicant respectfully traverses the outstanding claim rejections, and requests reconsideration and withdrawal thereof in light of the amendments and remarks presented herein.

II. Amendments

Claim 16 is amended and new claims 21-33 are added herein. Additionally, various amendments are made to the specification to correct typographical errors, grammatical errors, and other informalities present therein. No new matter is added by the amendments or claim additions presented herein.

More particularly, claim 16 is amended herein to clarify that the recited data structure and software code are stored to computer-readable media to ensure that this claim is directed to proper subject matter. The amendments to claim 16 are not intended to narrow the scope thereof and have not been made to avoid the prior art.

III. Rejections under 35 U.S.C. § 102(e) over *Peercy*

Claims 1-11 and 13-20 are rejected under 35 U.S.C. § 102(e) as being anticipated by *Peercy*. Applicant respectfully traverses this rejection as provided further below.

To anticipate a claim under 35 U.S.C. § 102, a single reference must teach every element of the claim, *see* M.P.E.P. § 2131. Applicant respectfully submits that *Peercy* fails to teach each and every element of claims 1-11 and 13-20.

A. Independent Claims 1 and 16

Each of independent claims 1 and 16 recite a parametric texture mapping function. For instance, independent claim 1 recites, in part, "utilizing at least said 3D coordinate frame to determine parameters of a <u>parametric texture mapping function</u>" (emphasis added). Similarly, independent claim 16 recites, in part, "software code, stored to computer-readable media, executable to utilize at least said 3D coordinate frame to determine parameters of a <u>parametric texture mapping function</u>" (emphasis added). *Peercy* fails to teach such a parametric texture mapping function as recited by these independent claims, as discussed further below.

Peercy is directed to a bump map technique, rather than a parametric texture mapping (PTM) technique. As discussed in the specification of the present application, PTM is a different texture mapping technique than bump mapping. Accordingly, one of ordinary skill in the art would not read *Peercy's* bump map technique as a PTM technique. In general, in a bump mapping technique, a bump map includes normal vectors that are associated with each pixel of a texture map that is applied to a geometric object. (*see e.g.*, col. 2, lines 1-29 and col. 3, line 34 – col. 4, line 4 of *Peercy*). Separate hardware/software components may evaluate specular and/or diffuse components of lighting (*see e.g.,* blocks 280 and 290 of FIGURE 2A of *Peercy*) for rendering a digital image. In contrast, a parametric texture map includes function(s) at each pixel of a texture map for evaluating certain variables (or parameters) for use in rendering pixels of a digital image. For instance, in certain PTM techniques, a function includes coefficients specifying a function that operates on two spatial variables (for defining X and Y coordinates within a digital image) and two variables defining lighting direction. Such PTM function may be used in rendering the pixels of digital image. That is, the pixel at each spatial location (corresponding to a certain value for the two spatial variables, X and Y) can be rendered taking into account specified lighting direction (defined by the two lighting variables provided to the PTM function). Thus, in the PTM technique, the texture map includes a function for use in rendering a digital image that takes into account such properties as lighting, etc., rather than merely defining a surface (with

normal vectors) and using separate hardware/software for determining the pixel values accounting for lighting conditions, etc., as in the bump mapping technique.

Certain embodiments of the present patent application provide a technique for determining, for each graphics primitive of an object, the orientation of the texture rendered via a parametric texture mapping (PTM) technique. For instance, independent claim 1 recites "for each of said plurality of graphics primitives, computing at least two texture coordinate gradient vectors; for each vertex of said plurality of graphics primitives, determining a 3D coordinate frame, wherein said determining step includes using said at least two texture coordinate gradient vectors…; and utilizing at least said 3D coordinate frame to determine parameters of a parametric texture mapping function." Again, *Peercy* is not directed to a parametric texture mapping function, but is instead directed to a bump mapping technique; and thus *Peercy* fails to teach all elements of independent claims 1 and 16.

In view of the above, the bump mapping technique of *Peercy* does not and cannot anticipate the recited parametric texture mapping function of independent claims 1 and 16 under 35 U.S.C. § 102(e). Accordingly, withdrawal of the rejection of independent claims 1 and 16 is respectfully requested.

B. Independent Claim 14

Peercy also fails to teach each and every element of independent claim 14. For instance, independent claim 14 recites, *inter alia*,

> determining a first vector from a first vertex of a graphics primitive to a second vertex of said graphics primitive;
> determining a second vector from said first vertex to a third vertex of said graphics primitive;
> calculating a first dot product of said first vector by said first vector;
> calculating a second dot product of said first vector and said second vector;
> <u>assigning one variable a value derived from at least said first dot product and said second dot product;</u>
> <u>computing at least two texture coordinate gradient vectors utilizing at least said one variable, wherein said at least two texture coordinate gradient vectors are indicative of orientation of a texture mapped to said graphics primitive;</u>
> determining a 3D coordinate frame for each vertex of said graphics primitive, wherein said determining comprises using said at least two texture

> coordinate gradient vectors for orienting said 3D coordinate frame; and
> utilizing at least said 3D coordinate frame in mapping said texture to said 3D object. (Emphasis added).

Peercy fails to teach all of the above elements of claim 14. Particularly, *Peercy* fails to teach computing at least two texture coordinate gradient vectors utilizing at least a variable derived from the first and second dot products, where such texture coordinate gradient vectors are indicative of orientation of a texture mapped to the graphics primitive. The present Office Action cites column 4, lines 26-48 and column 9, lines 47-56 as teaching the above-identified elements of claim 14. Applicant respectfully asserts that the relied upon portion of *Peercy* does not teach the above elements of claim 14, as discussed further below.

Column 4, lines 26-48 of *Peercy* describes that a bump mapping module performs a vector operation for each pixel where (a) a first dot product is calculated between the normalized tangent space lighting vector and the perturbed normal in tangent space for each pixel (representing a diffuse component of such pixel) and (b) a second dot product is calculated between the normalized tangent space half angle vector and the perturbed normal in tangent space for each pixel (representing a specular component of such pixel).

Peercy does not teach calculating a first dot product of a first vector by a first vector, as recited by claim 14. That is, *Peercy* does not teach calculating a dot product of a first vector with itself (e.g., first_vector • first_vector). For instance, each of the above-mentioned dot product calculations of *Peercy* compute the dot product of two different vectors. Thus, *Peercy* fails to teach the recited first dot product of claim 14.

Further, while the above portion of *Peercy* describes computing a first dot product to determine a diffuse component of a pixel and a computing a second dot product to determine a specular component of a pixel, *Peercy* fails to teach or suggest deriving a variable from such first and second dot products and using the derived variable to compute at least two texture coordinate gradient vectors that are indicative of orientation of a texture mapped to the graphics primitive.

Peercy also teaches at column 9, lines 47-56 that a local reference frame is created at each point on the object surface, where the local reference frame is defined by the tangent plane, a normal vector N, and a binormal vector B. However, again *Peercy* fails to teach

deriving a variable from first and second dot products and using the derived variable to compute at least two texture coordinate gradient vectors that are indicative of orientation of a texture mapped to the graphics primitive. Thus, the orientation of the 3D coordinate frame of *Peercy* is not determined from texture coordinate gradient vectors such as those defined by independent claim 14.

In view of the above, *Peercy* does not teach all elements of claim 14 and thus fails to anticipate claim 14 under 35 U.S.C. § 102(e). Accordingly, withdrawal of the rejection of independent claim 14 is respectfully requested.

C. Dependent Claims 2-11, 13, 15, and 17-20

Dependent claims 2-11, 13, 15, and 17-20 stand rejected under 35 U.S.C. § 102(e) as being anticipated by *Peercy*. In view of the above, Applicant respectfully submits that independent claims 1, 14, and 16 are not anticipated by *Peercy* because *Peercy* fails to teach every element of those independent claims. Further, each of dependent claims 2-11, 13, 15, and 17-20 depend either directly or indirectly from one of independent claims 1, 14, and 16, and thus inherit all limitations of the respective independent claim from which they depend. It is respectfully submitted that dependent claims 2-11, 13, 15, and 17-20 are allowable not only because of their dependency from their respective independent claims for the reasons discussed above, but also in view of their novel claim features (which both narrow the scope of the particular claims and compel a broader interpretation of the respective base claim from which they depend).

IV. Rejections Under 35 U.S.C. § 103(a)

Claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Peercy* in view of *Peercy '876*. Dependent claim 12 depends from independent claim 1 (and thus inherits all limitations of claim 1). In view of the above, Applicant respectfully submits that independent claim 1 is of patentable merit. It is respectfully submitted that dependent claim 12 is allowable at least because of its dependency from independent claim 1 for the reasons discussed above.

V. New Claims 21-33

New claims 21-33 are presented herein. Claims 21-23 each depend from claim 1 and are believed to be allowable at least for the reasons discussed above with regard to claim 1. Claims 24, 28, and 32 are independent claims. Claims 25-27 depend from claim 24, claims 29-31 depend from claim 28, and claim 33 depends from claim 32. Claims 24-33 are also believed to be of patentable merit over the applied references of record.

For instance, independent claim 24 recites, *inter alia*, "using the determined 3D coordinate frame of said at least one graphics primitive for solving a parametric texture mapping (PTM) function for each pixel of the corresponding graphics primitive." At least this element of claim 24 is not taught by the applied references of the current Office Action.

Independent claim 28 recites, *inter alia*, "utilizing at least said 3D coordinate frame to determine parameters of a parametric texture map (PTM) that includes a biquadric function having at least four independent variables, where a first two of said four independent variables are for indexing the PTM and the other two of said four independent variables are for evaluating the PTM function." At least this element of claim 28 is not taught by the applied references of the current Office Action.

Independent claim 32 recites various elements that are not taught by the applied references. For instance, claim 32 recites "determine a first gradient vector (G_s) that identifies the direction of maximum change in a first texture coordinate (*s*) as $G_s = p_s * D_1 + q_s * D_2$ … and determine a second gradient vector (G_t) that identifies the direction of maximum change in a second texture coordinate (*t*) as $G_t = p_t * D_1 + q_t * D_2$." The applied references of the current Office Action fail to teach at least these elements of claim 32.

VI. Conclusion

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Any fees due that are not covered by the attached Transmittal should be charged to Deposit Account No. 08-2025, under Order No. 10015870-1 from which the undersigned is authorized to draw.

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail, Label No. EV 482737229US in an envelope addressed to: MS Amendments, Commissioner for Patents, Alexandria, VA 22313.

Date of Deposit: May 18, 2004

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